A

Synopsis of the thesis entitled:

"IMPACT OF SOME TRACE METALS AND EFFECTS OF AGRICULTURAL WASTE ON LIMBOTI WATER RESERVOIR"

To be submitted to

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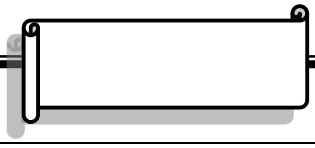

INDEX

Sr. No.	Chapter	Page No.
1	Introduction	03
2	Objectives	08
3	Methodology	09
4	Importance of study	13
5	Work Plan	14
6	References	15

INTRODUCTION:

The human interference and it's continuously disturbance lead to harming the nature and its surrounding environment through many ways. Synthetic activities are widely responsible for increasing the toxic and harmful metals especially in aquatic ecosystem and it is turn into an important planetary level problem. Momentarily, the water pollution is a worst level.

Most of our water resources are gradually becoming contaminated due to the addition of foreign materials from the surroundings. These elements which includes organic material, agricultural as well as industrial waste, runoff, sewage effluents and solid waste. It is also fluctuates by increased industrialization and urbanization without proper management and environmental planning.

Anthropogenic activities continuously increase the amount of heavy metals in the environment, especially in aquatic ecosystem. In fresh water environment trace metals are potentially accumulated in sediments and organisms and subsequently transferred to man through the food chain. Trace metal contaminations are important due to their potential toxicity for the environment and human beings. (Gueu, et al 2007).

The Water pollution problem is caused my toxic metals, has begun lead concern now in rural and urban areas of the various parts in the world. The harmful metals entering in an ecosystem which may lead to bioaccumulation and bio-magnification etc. Heavy metals like Fe, Cu, Zn, Ni, and other trace elements are important for proper growth of biological life forms and their functioning with their deficiency and excess could lead to a number of disorders.

As heavy metals cannot be degraded, they are deposited, assimilated or incorporated in water, sediment and aquatic animals (Linnik and Zubenko, 2000) and resemble in food chain. Bioaccumulation results from a dynamic equilibrium between exposures from the outside environment and excretion, uptake and storage with in a degradation of organism.

The extent of bio-aggregation depends on the concentration of chemicals in the environment. The complexion of chemical itself, such as its solubility in water and

fat, affects its uptake and storage. Equally important is the capability of the organism to deteriorate and excrete a particular chemical. When exposure desists, the body unceasingly metabolizes and excretes the chemicals.

Essential factors of Water:

Water dissolves more minerals, vitamins and chemicals than any other liquid. For this reason it is called the "universal solvent." pure water has neither smell nor taste and cannot conduct electricity; dissolved minerals in water give it taste, smell and ability to conduct electricity. This means that wherever water goes, either through the ground or through our bodies, it takes along valuable chemicals, minerals, and nutrients.

Surface water is easily polluted and contaminated. Mud, animal waste, parasites, chemicals, garbage, and other foreign matter can make the water unusable. This contamination of surface water contributes to many deaths over the globe where clean water is not available. In areas where communities have the power to clean their water before use, this danger has been avoided. Freshwater ecosystems support human life in numerous ways; on top of being a source of drinking water, rivers provide water for irrigation, industry, transport and many other aspects of food production of food production and processing. Pollution of the aquatic environment by inorganic chemicals and heavy metals is a major threat to human health and to aquatic organisms (Samir and Ibrahim et al., 2008).

Soil and Agriculture:

The increasing human population is placing greater pressure on soil and water resources and threatening our ability to produce sufficient food, feed, and fiber. As a result, there is a growing consensus within our global community that the protection of natural resources and implementation of environmentally and economically sound agriculture practices is of the utmost priority. The environment is considered in terms of the most tangible aspects like air, water and food, and the less tangible, though no less important, the communities we live in (Gore, et al 1997).

The basic physical, chemical, and biological properties of soils must be considered to maintain sustainable agricultural practices. Through the study of soil science the importance of this heterogeneous assemblage of minerals, organic matter, organisms, air, and water as a key component of our global environment becomes self-evident. Soils provide a wide range of important ecosystem services such as a living filter for water, a sink for carbon, a regulator of atmospheric gasses, and a medium for plant growth which helps to sustain all life on this plant.

Effects of Agricultural Waste:

Agriculture, as the single largest user of freshwater on a global basis and as a major cause of degradation of surface and groundwater resources through erosion and chemical runoff, has cause to be concerned about the global implications of water quality. The associated agro food processing industry is also a significant source of organic pollution in most countries. Aquaculture is now recognized as a major problem in freshwater ecosystem, leading to eutrophication and ecosystem damage.

Agricultural pollution comes from several sources. Pesticides and fertilizers comprise the bulk of agricultural waste and include man-made synthetic chemicals and materials. Synthetic compounds often do not biodegrade upon exposure to the air or water and may linger for decades or even a century. These chemicals are sprayed on crop fields to keep insects away and enter streams and waterways as runoff. Contaminated water is another primary effect of agricultural waste; water becomes contaminated through fertilizer and pesticide residue, along with pathogens such as viruses and bacteria, which may enter drinking water systems.

According to Conserve Energy Future, agricultural pollution is a primary source of pollution in water and lakes, as chemicals and toxins make their way into groundwater upon settling at the bottoms of these large water bodies. The accumulation of these substances ultimately leads to health issues such as blue baby syndrome and neurological ailments. Agricultural waste can also negatively affect aquatic animals and plants because fertilizers, manure, ammonia and waste make their way into local environments and disrupt ecosystem processes.

Study Area:

Limboti dam is situated near Limboti village of Loha tehsil. It is an earthfill dam on Manar River, it supports many villages along with Limboti, near Nanded in Maharashtra state. The latitude 18.96 and longitude 72.82 are the geographic coordinates of the Limboti dam.

Limboti is a Village in Loha Taluka in Nanded district of Maharashtra State, India. It belongs to Aurangabad divisional area.

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Figure: Google image of the Limboti reservoir near Limboti Village.

This Place is in the border of the Nanded District and Parbhani District. Parbhani District Palam is north towards this place.

The Limboti dam is located about 7Km away from the kandhar and about 25Km from Ahmedpur. Khandar and Ahmedpur both are taluka places but belong to different districts i.e. Nanded and Latur, Respectively. From Limboti water is supplied to Ahmedpur, Kandhar and Loha city.

GPS Sampling Site Locations:

Sr. no	Sampling sites	Latitudes	Longitudes
1.	Site 1	18°47'27.65"N	77° 2'33.70"E
2.	Site 2	18°47'14.21"N	77° 1'51.75"E
3.	Site 3	18°47'0.78"N	77° 1'8.26"E

Salient features of Limboti Reservoir

Attribute	Value
Name of the Dam	Limboti dam
River	Manar
Nearest City	Limboti
District	Nanded
State	Maharashtra
Basin Name	Godavari
Dam Type	Earthen
District Benefited	Nanded and Latur

Attribute	Value
Dam Status	Ongoing
Purpose	Irrigation
Length of Dam (m)	2,592
Year of Start of Work	1984
Operating and Maintenance Agency	WRD, GOM
Max Height above Foundation(m)	27
Total Volume content of Dam (TCM)	374
Spillway Capacity (cumec)	372

AIMS AND OBJECTIVES:

1. To investigate selected trace metal content and their amount.
2. To identify the role of trace metals also its effects on water quality.
3. To evaluate the impact of agricultural waste on water quality.
4. To observe and comment on natural and anthropogenic trace metal pollution status etc.
5. To suggest remedial measures on water conservation and future use strategies.

METHODOLOGY:

Metals are transported from nearby silts, rocks and domestic and agricultural runoff etc. These metals play a important role in supplying micro-metals for human consumption. It is required to investigate certain metals which are essential for biological life. Hence following metals are selected for the proposed study. Water samples will be collected in clean polyethylene containers brought to analyzed in laboratory. The systematic experimental investigations of these trace metals in an aquatic food chain mainly in water will be carried out.

The water samples of Limboti reservoir will be collected from three sampling sites, (as S_1 S_2 $S_{3,}$). Water samples will be collected in pre cleaned polyethylene plastic bottles with caps. Water samples will be collected Twice in a month for about two or more years for studies. Considering the huge water storage three sampling sites have been selected for the present undertaken research work.

1. **Temperature** (Micro-thermometer ^{o}C):

Temperature is measure of the hotness of any material. The measurement of temperature in water is important basically for its effects on the chemistry and biochemical reaction in the organisms. It is also important in the determination of pH, conductivity and saturation level of gases in water. The temperature is best determined by the use of mercury thermometers up to the desired accuracy in ^{o}C**.**

2. **pH** (Digital pH Meter):

It is the log of reciprocal of hydrogen ion concentration in moles per liter. Practical pH scale extends from 0 to 6.99 as Acidic, 7.0 as Neutral and 7.01 to 14 as Alkaline. The pH value is widely used for primary treatment requirements of water and wastewater. The pH is determined by using pH papers, Litmus papers and Colorimetric indicator method for recording approximate pH values. The Electrometric method is the most accurate method for the pH measurements and is relatively free from interferences.

3. Biochemical Oxygen Demand:

BOD is amount of oxygen utilized by microorganisms in stabilizing the organic matter. On an average basis, the demand for oxygen is proportional to the amount of organic waste to be degraded aerobically. The Biochemical Oxygen Demand (B.O.D.) of sewage or of polluted water is the amount of oxygen required for the biological decomposition of dissolved organic matter to occur under aerobic condition and at the standardised time and temperature.

Usually, the time is taken as 5 days and the temperature 20°C as per the global standard. The B.O.D. test is among the most important method in sanitary analysis to determine the polluting power, or strength of sewage, industrial wastes or polluted water. It serves as a measure of the amount of clean diluting water required for the successful disposal of sewage by dilution. The test has its widest application in measuring waste loading to treatment plants and in evaluating the efficiency of such treatment systems. Outcome is in mg/L.

4. Chemical Oxygen Demand:

COD is the measure of oxygen consumed during the oxidation of the oxidizable organic matter by strong oxidizing agent. Potassium in the presence of sulphuric acid is generally used as an oxidizing agent in determination of COD. Its results are reported in terms of mg of oxygen.

5. **Phosphate** (Spectrophotometer):

A phosphate (PO^{3-}_4) is an inorganic chemical and a salt of phosphoric acid. In organic chemistry, a phosphate, or organophosphate, is an ester of phosphoric acid. Of the various phosphoric acids and phosphates, organic phosphates are important in biochemistry and biogeochemistry (ecology), and inorganic phosphates are mined to obtain phosphorus for use in agriculture and industry. At elevated temperatures in the solid state, phosphates can condense to form pyrophosphates. The addition and removal of phosphates from proteins in all cells is a pivotal strategy in the regulation of metabolic processes. Phosphorylation and dephosphorylation are important ways that energy is stored and released in living systems.

6. **Nitrite - Nitrogen:** (Spectrophotometer):

The Nitrite Nitrogen (NO_2-N), which has the chemical formula NO^-_2, is a symmetric anion with equal N–O bond lengths. Upon protonation, the unstable weak acid nitrous acid is produced. Nitrite can be oxidized or reduced, with the product somewhat dependent on the oxidizing/reducing agent and its strength. The nitrite ion is an ambidentate ligand, and is known to bond to metal centers in at least five different ways.[1] Nitrite is also important in biochemistry as a source of the potent vasodilator nitric oxide. In organic chemistry the $–NO_2$ group is present in nitrous acid esters and nitro compounds. Nitrites are also used in the food production industry for curing meat. It is measured in mg/L.

7. **Copper :**

Copper is a very common substance that occurs naturally in the environment and spreads through the environment through natural phenomena. Humans widely use copper. For instance it is applied in the industries and in agriculture. The production of copper has lifted over the last decades. Due to this, copper quantities in the environment have increased.

The world's copper production is still rising. This basically means that more and more copper ends up in the environment. Rivers are depositing sludge on their banks that is contaminated with copper, due to the disposal of copper-containing wastewater. It will then end up mainly in soils. As a result soils may also contain large quantities of copper after copper from the air has settled. It is estimated by Neocuproine method using UV double beam spectrophotometer at wavelength of 457 nm and the result will be expressed in mg/L.

8. **Iron:**

It is a metal in the first transition series, most common element in the whole planet Earth, forming much of Earth's outer and inner core. Iron plays an important role in biology, forming complexes with molecular oxygen in hemoglobin and myoglobin; those two compounds are common oxygen transport proteins in vertebrates. Iron is also the metal used at the active site of many

important redox enzymes dealing with cellular respiration and oxidation, reduction in plants and animals.

It is estimated by thiocynate procedure using UV double beam spectrophotometer at wavelength of 510 nm and the result will be expressed in mg/L . Iron is most transition metal in the human body, 4.2 to 6.1 gm in an average man. It is a trace element, required by both plants and animals, also for microbial systems.

9. Manganese :

It found as a free element in nature and has many important industrial applications. It is estimated by using Persulphate procedure using UV double beam spectrophotometer at wavelength of 545 nm and the result will be expressed in mg/L or mg/L. Manganese is a grayish white metal similar in appearance of cast iron. It occurs in cells of all living organisms. It is considered as twelfth most abundant element and the fifth most abundant metal. It is also used in photosynthetic oxygen evolution.

10. Zinc:

Zinc is a trace element that is essential for human health. When people absorb too little zinc they can experience a loss of appetite, decreased sense of taste and smell, slow wound healing and skin sores. Zinc-shortages can even cause birth defects. Although humans can handle proportionally large concentration of zinc, too much zinc can still cause eminent health problems, such as stomach cramps, skin irritations, vomiting, nausea and anemia. Very high levels of zinc can damage the pancreas and disturb the protein metabolism, and cause arteriosclerosis. Extensive exposure of zinc chloride can cause respiratory disorders. It is estimated by Dithizone method using UV double beam spectrophotometer at wavelength of 535 nm and the result will be expressed in mg/L.

11. Fluoride (Spectrophotometer):

Many fluoride minerals are known, but of paramount commercial importance are fluorite and fluorapatite. Fluoride is found naturally in low concentration in drinking water and foods. Water from underground sources are more likely to have

higher levels of fluoride, whereas the concentration in seawater averages 1.3 parts per million (ppm). Fresh water supplies generally contain between 0.01 to 0.3 mg/L.

IMPORTANCE OF STUDY:

Agriculture is an important source of sediment, nutrients, pesticides, salts, and pathogens. The presence of these materials in water resources can impose costs on water users. Some estimates of the cost to water uses have been made, but overall, an accounting of the economic damages caused by poor water quality is lacking, due to a lack of physical monitoring and the difficulties in estimating economic costs and benefits for environmental good and services.

Disturbing the soil through tillage and cultivation and leaving it without vegetative cover may increase the rate of soil erosion. Dislocated soil particles can be carried in runoff water and eventually reach water resources, including streams, rivers, lakes, reservoirs and wetlands. Sediment is the largest contaminant of surface water by weight and volume (Koltun et al., 1997).

Water is an indispensable part of biological life of mankind water is liquid of life, as there can be no life without water. Anthropogenic activities are continuously increasing the amount of heavy metals in the environment, especially in aquatic ecosystem. As heavy metals cannot be degraded, they are deposited assimilated or incorporated in water, sediment and aquatic animals. Pollution of heavy metals in aquatic eco-system is growing at an alarming rate and has become an important worldwide problem (Malik., et al 2010).

On the other hand, heavy metals are natural elements that occur in the earth crust. Some of these metals are necessary for human health and metabolic activities in trace amounts. (Haward, 2002 and Smith., et al 2007). The heavy metals from these sources are dispersed in the environment and they contaminate soil, water and air. (Szyczewski, et al 2009).

Considering the quality of water and its significant role in human life, it is highly necessary to observe the various stress on water quality. Keeping

view that, this water will be highly useful resource for several activities, like Agriculture, Fishing, Industrial, Irrigational and some others works. However, we have decided to work on some as above selected water parameters etc.

WORK PLAN:

FIELD OF STUDY	IMPACT OF SOME TRACE METALS AND EFFECT OF AGRICULTURAL WASTE ON LIMBOTI WATER RESERVOIR.
START OF PhD STUDIES	AFTER COMPLETION OF REGISTRATION PROCEDURE.
STANDRED TERM OF STUDIES	THREE YEARS
FORM OF STUDIES	FULL TIME

Structure of Research Work:

TIME (MONTH)	**WORK**
00-06	REVIEW OF LITRATURE AND PROCEDURE PREPRATION
06-30	ANALYSIS OF WATER SAMPLE AND OTHER WORK
30-36	DATA COLLECTION/STATISTICAL INTERPRETATION, WRITING OF THESIS AND SUBMISSION

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